Spot Safety Project Evaluation

Project Log # 200512169

Spot Safety Project # 10-98-200

Spot Safety Project Evaluation of the Flashing Traffic Signal Installation At the Intersection of SR 1001-SR 1606 (Sikes Mill Rd), SR 1618 (Tom Helms Rd), SR 1637 (Lawyers Rd), and SR 1001 (Love Mill Rd) Union County

Documents Prepared By:

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_____ 02/22/2006
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Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-98-200 – The intersection of SR 1001-SR 1606 (Sikes Mill Rd), SR 1618 (Tom Helms Rd), SR 1637 (Lawyers Rd), and SR 1001 (Love Mill Rd), Union County.

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis and an Odds Ratio comparison analysis of the treatment data has been completed to measure the effectiveness of the spot safety improvement. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an overhead flashing traffic signal. All approaches are 2-lane facilities with no turn lanes. SR 1618 (Tom Helms Rd) and SR 1637 have speed limits of 45 mph, while the other approaches have speed limits of 55. The southern approach of SR 1606 (Sikes Mill Rd) and the northern approach of SR 1001 (Sikes Mill Rd) have recommended speed limits of 45 mph. The subject location is a five-leg intersection, which is controlled by oversized stop signs on SR 1618 (Tom Helms Rd), SR 1637 (E. Lawyers St), and SR 1001 (Love Mill Rd). All approaches with stop conditions have "Stop Ahead" signs, while the continuous approaches have intersection warning signs.

There are 3 schools located near the intersection on the northern approach of SR 1606 (Sikes Mill Rd) and a school located near the intersection on the western approach of SR 1637 (Lawyers St). The principals of Piedmont High School and Piedmont Middle School requested the initial study.

There were a total of 14 crashes reported during the initial study from 1/1/1993 to 9/1/1997. These crashes included 9 Angle, 1 Left Turn-Same Roadway, 1 Sideswipe, 2 Rear-End, and 1 Ran Off Roadway Crashes. The final completion date for the flashing traffic signal installation at the subject intersection was on August 1, 1999, with a total cost of $5,000.

Comparison Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from

July 1, 1999 to September 30, 1999. The before period consisted of reported crashes from July 1, 1993 through June 30, 1999 (6 years) and the after period consisted of reported crashes from October 1, 1999 to September 30, 2005 (6 years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was conducted.

The analysis consisted of two different sets of data, the treatment and the comparison data. The treatment data consisted of all crashes within 150 feet of the subject intersection. The comparison data consisted of all crashes along a strip on SR 1001 (Sikes Mill Rd) from 150 feet east of SR 2713 (Briarcliff Dr) to 150 feet east of SR 1617/SR 1619 (Tom Boyd Rd), with a y-line of 150 feet. Please see attached *Location Map* for further detail. The following data table depicts the Naive Before and After Analysis for the treatment intersection and comparison strip. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information

	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	17	25	47.1
Total Severity Index	6.76	2.48	-63.3
Frontal Impact Crashes	13	20	53.8
Frontal Severity Index	7.4	2.85	-61.5
Volume	4400	5600	27.3

Comparison Information

	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	20	20	0.0
Total Severity Index	15.33	4.33	-71.8
Frontal Impact Crashes	13	8	-38.5
Frontal Severity Index	21.34	5.62	-73.7
Volume	2600	3000	15.4

Odds Ratio: Treatment versus Comparison

	Before	After	Percent Reduction (-) Percent Increase (+)
Treatment Total Crashes	17	25	47.1
Comparison Total Crashes	20	20	---
Treatment F.I. Crashes	13	20	150.0
Comparison F.I. Crashes	13	8	---

The naive before and after analysis at the treatment location resulted in a 47.1 percent increase in Total Crashes, a 53.8 percent increase in Frontal Impact Crashes and a 27.3 percent increase in Average Daily Traffic (ADT). The comparison locations experienced no change in Total Crashes, a 38.5 percent decrease in frontal crashes, and a 15.4 percent increase in ADT. The before period ADT year was 1998 and the after period ADT year was 2002.

The Odds Ratio is used as another means of calculating the treatment effect. The number of crashes in the before and after period from the Comparison are used to calculate the percent reduction in crashes for the Treatment Intersection. As shown in the previous table, using the Odds Ratio calculation, there is a 47.1 percent increase in Total Treatment Intersection crashes and a 150.0 percent increase in Frontal Impact crashes.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 47.1 percent increase in Total Crashes and a 53.8 percent increase in Frontal Impact Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 47.1 percent increase in Total Crashes and a 150 percent increase in Frontal Impact Crashes. The summary results above demonstrate that the treatment location appears to have had an increase in both Total Crashes and Frontal Impact Crashes from the before to the after period. When using the Odds Ratio to measure the treatment effect there appears to be an even greater increase in Frontal Impact Crashes.

The reduction in the Severity Index is not as significant as it appears. There has actually been an increase in injury crashes from the before to the after period. The high severity index in the before period was caused by 1 "A" injury crash.

After reviewing the crash reports and referencing the *Collision Diagram*, there does not appear to be a problem with vehicles running the stop signs. After conducting a site investigation, there also does not appear to be any site distance deficiencies in the road design. Again referencing the *Collision Diagram*, there is no crash patterns that stand out in the before period.

Analyzing the crash reports showed that a large portion of the crashes in both the before and after periods occurred during the most heavily traveled hours of the day (7:00-8:30 AM and 3:15-6:00 PM). A larger "rush hour" was used because of the proximity to the schools. Seventy-six and a half percent (76.5%) of before period crashes (13 out of 17) and 68 percent of after period crashes (17 out of 25) occurred during these hours.

Referencing the *Collision Diagrams*, there has been a noticeable increase from the before period to the after period in crashes between vehicles travelling south on SR 1606 (Sikes Mill Rd) and southwest on SR 1001 (Love Mill Rd), from 2 to 7. There has also been a noticeable increase in crashes between southbound SR 1606 traffic and vehicles from SR 1618 (Tom Helms Rd), from 2 to 5. As previously stated, there is no site distance problems from either stop condition.

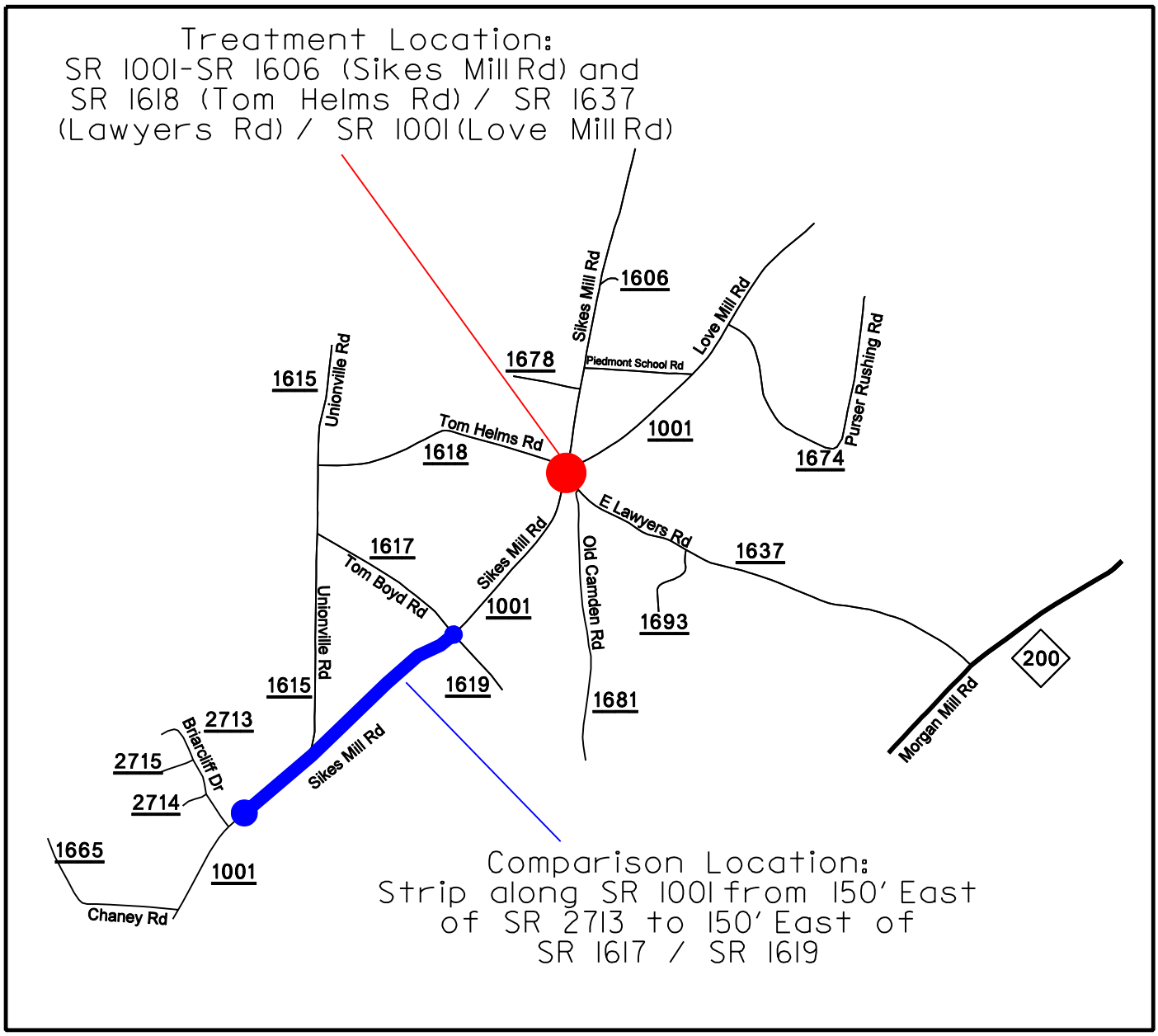
After reviewing the crash reports and conducting a site investigation, it is apparent the 5 approaches, proximity to school zones, and statutory speeds all contribute to the crashes. Vehicles entering the intersection from one of the 3 stop sign approaches must be aware of many potential conflicts, which is made more confusing by the increase in traffic during high peak periods.

According to the NCDOT Division 10 office this intersection was planned to be a NC Moving Ahead Project with turn lanes and a possible signal, but is not currently funded.

Please see the attached *Treatment Site Photos*. Photos are provided for all five approaches to the intersection.

The countermeasure crash reduction for Total Crashes at the subject intersection is a 47.1 percent increase in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection can be in the range of a 53.8 to 150.0 percent increases in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors.

Location Map
Union County
Evaluation of Spot Safety Project
#10-98-200



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Treatment Site Photos Taken 2/16/2006

Traveling East on SR 1618 (Tom Helms Rd)

At Stop Sign on SR 1618, Looking Forward

Traveling South On SR 1606 (Sikes Mill Rd)

Traveling South on SR 1606 (Sikes Mill Rd)

Traveling Southwest on SR 1001 (Love Mill Rd)

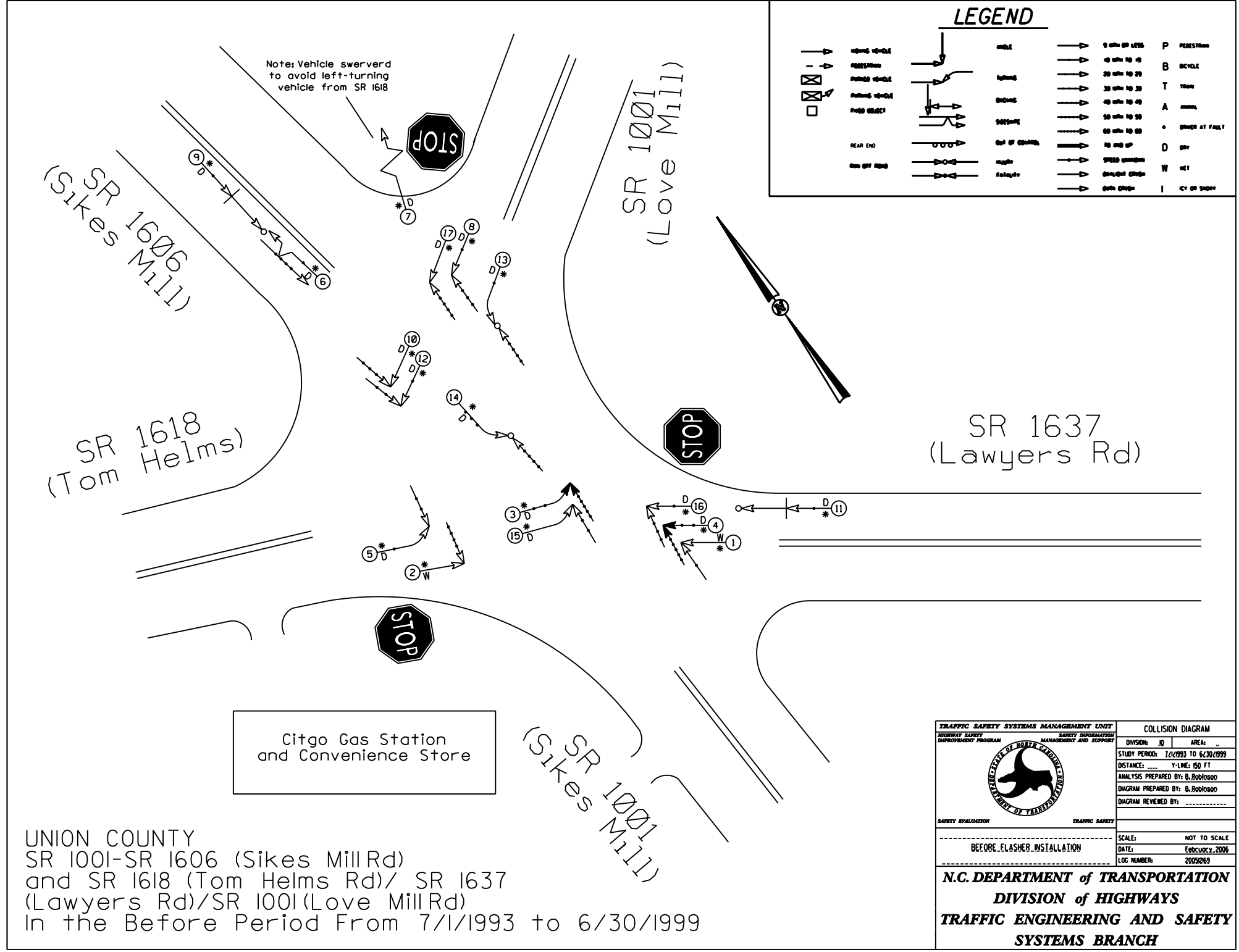
Traveling Southwest on SR 1001 (Love Mill Rd)

Traveling West on SR 1637 (E Lawyers Mill Rd)

Traveling West on SR 1637 (E Lawyers Mill Rd)

Traveling Northeast on SR 1001 (Sikes Mill Rd)

Traveling Northeast on SR 1001 (Sikes Mill Rd)



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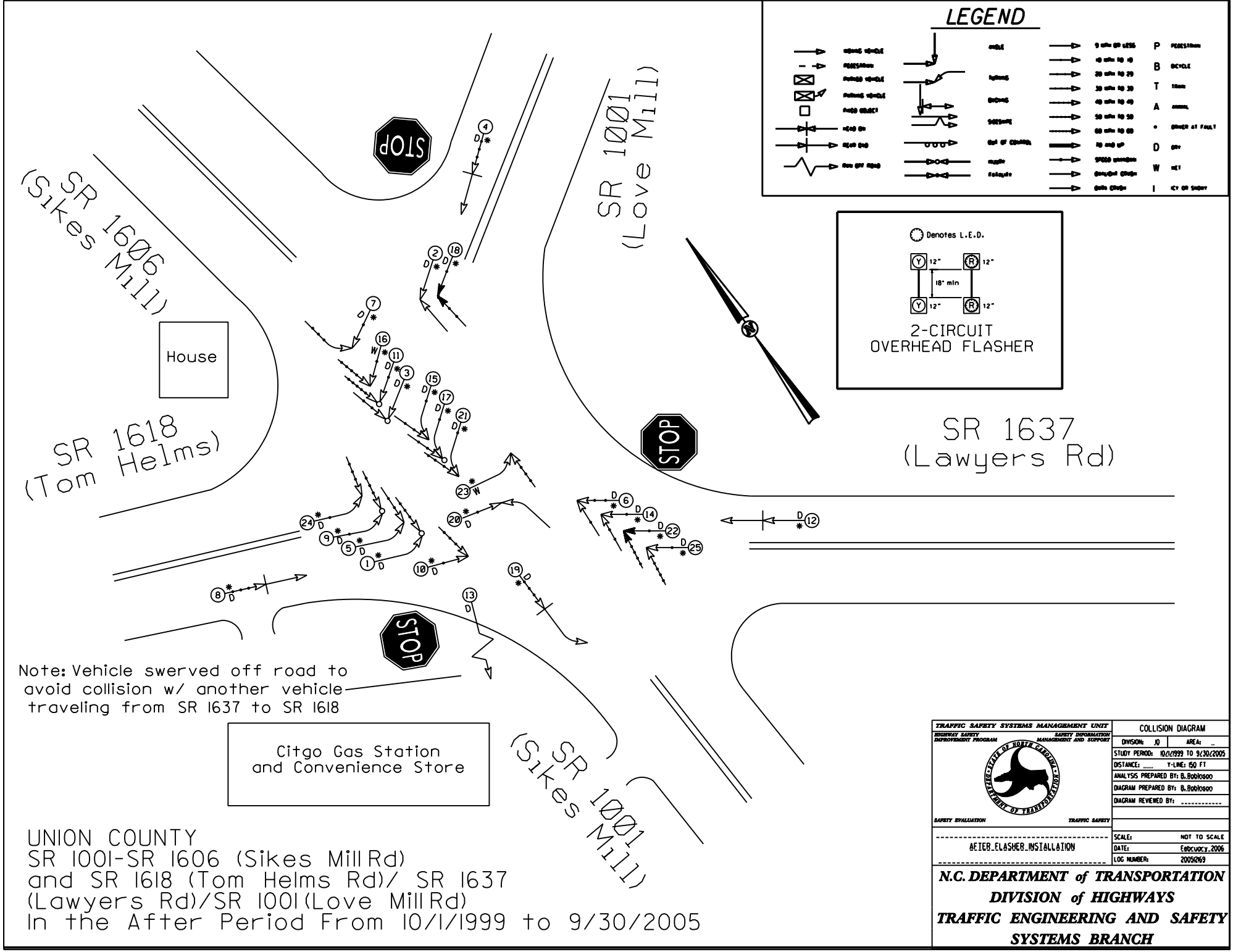

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